Math 121

Self-Assessment Quiz #9

Week 11

- Please see the course webpage for the answer key.
- **1.** (a) Use the MacLaurin Series representation for $f(x) = x^3 \sin(x^2)$ to

Estimate
$$\int_0^1 x^3 \sin(x^2) dx$$
 with error less than $\frac{1}{100}$.

Justify in words that your error is indeed less than $\frac{1}{100}$.

- (b) Estimate $\frac{1}{\sqrt{e}}$ with error less than $\frac{1}{100}$ Justify.
- 2. Find the sum for each of the following series.

(a)
$$1-2+\frac{4}{2!}-\frac{8}{3!}+\frac{16}{4!}-\frac{32}{5!}+\dots$$

(b)
$$\frac{1}{3\pi} - \frac{1}{18\pi^2} + \frac{1}{81\pi^3} - \frac{1}{324\pi^4} + \dots$$

(c)
$$\sum_{n=0}^{\infty} \frac{(-1)^n (\ln 9)^n}{2^{n+1} n!}$$

(d)
$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots$$

(e)
$$-\frac{\pi^2}{2!} + \frac{\pi^4}{4!} - \frac{\pi^6}{6!} + \frac{\pi^8}{8!} - \dots$$

(f)
$$\frac{1}{\sqrt{3}} - \frac{1}{9\sqrt{3}} + \frac{1}{45\sqrt{3}} - \frac{1}{189\sqrt{3}} + \dots$$

(g)
$$\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{9^n (2n+1)!}$$

(h)
$$\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{2^{4n} (2n)!}$$